

Applicant: ISHIZAKA *et al.*
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Listing of the Claims:

This listing of claims replaces all prior versions, and listings, of claims in this application.

Claim 1 (Original): A substrate treatment device comprising:

a treatment chamber in which a substrate is to be placed;

a supply system configured to supply at least two kinds of treatment gases to said treatment chamber;

an exhaust system having a pump, configured to exhaust the treatment gases from said treatment chamber; and

a capturing unit interposed between said treatment chamber and said pump and containing fine grains, configured to capture by the fine grains at least one kind of the treatment gas exhausted from said treatment chamber.

Claim 2 (Original): A substrate treatment device as set forth in claim 1, wherein the fine grains contained in said capturing unit are zeolite.

Claim 3 (Original): A substrate treatment device as set forth in claim 1, wherein said capturing unit captures the treatment gas that is liquid or solid at room temperature and at atmospheric pressure.

Claim 4 (Original): A substrate treatment device as set forth in claim 1, wherein the treatment gas captured by said capturing unit is at least one of TiF_4 , TiCl_4 , TiBr_4 , TiI_4 , $\text{Ti}[\text{N}(\text{C}_2\text{H}_5\text{CH}_3)_2]_4$, $\text{Ti}[\text{N}(\text{CH}_3)_2]_4$, $\text{Ti}[\text{N}(\text{C}_2\text{H}_5)_2]_4$, TaF_5 , TaCl_5 , TaBr_5 , TaI_5 , $\text{Ta}(\text{NC}(\text{CH}_3)_3)(\text{N}(\text{C}_2\text{H}_5)_2)_3$, $\text{Ta}(\text{OC}_2\text{H}_5)_5$, $\text{Al}(\text{CH}_3)_3$, $\text{Zr}(\text{O}-t(\text{C}_4\text{H}_9))_4$, ZrCl_4 , SiH_4 , Si_2H_6 , SiH_2Cl_2 , and SiCl_4 .

Claim 5 (Original): A substrate treatment device as set forth in claim 1, further comprising: a supply controller configured to control said supply system to supply the treatment gases alternately.

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Claim 6 (Original): A substrate treatment device comprising:

- a treatment chamber in which a substrate is to be placed;
- a supply system configured to supply at least two kinds of treatment gases to said treatment chamber;
- an exhaust system having a pump, configured to exhaust the treatment gases from said treatment chamber; and
- a capturing unit interposed between said treatment chamber and said pump, configured to capture by a chemical action at least one kind of the treatment gas exhausted from said treatment chamber.

Claim 7 (Original): A substrate treatment device as set forth in claim 6, wherein said capturing unit has a metal oxide to capture the treatment gas.

Claim 8 (Original): A substrate treatment device as set forth in claim 7, wherein the metal oxide is Al_2O_3 .

Claim 9 (Original): A substrate treatment device as set forth in claim 6, further comprising:

- a supply controller configured to control said supply system to alternately supply the treatment gases.

Claim 10 (Original): A substrate treatment device comprising:

- a treatment chamber in which a substrate is to be placed;
- a supply system configured to supply at least two kinds of treatment gases to said treatment chamber;
- an exhaust system having at least one pump, configured to exhaust the treatment gases from said treatment chamber; and
- an inert gas supply system configured to supply an inert gas into said exhaust system that is on a downstream side of the pump on a final stage.

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Claim 11 (Original): A substrate treatment device as set forth in claim 10, wherein the inert gas includes at least one of Ar, He, and N₂.

Claim 12 (Original): A substrate treatment device as set forth in claim 10, wherein the treatment gases include at least one of TiF₄, TiCl₄, TiBr₄, TiI₄, Ti[N(C₂H₅CH₃)₂]₄, Ti[N(CH₃)₂]₄, Ti[N(C₂H₅)₂]₄, TaF₅, TaCl₅, TaBr₅, TaI₅, Ta(NC(CH₃)₃)(N(C₂H₅)₂)₃, Ta(OC₂H₅)₅, Al(CH₃)₃, Zr(O-t(C₄H₉))₄, ZrCl₄, SiH₄, Si₂H₆, SiH₂Cl₂, and SiCl₄.

Claim 13 (Original): A substrate treatment device as set forth in claim 10, further comprising:

a supply controller configured to control said supply system to alternately supply the treatment gases.

Claim 14 (Original): A substrate treatment device comprising:

a treatment chamber in which a substrate is to be placed;

a supply system configured to supply at least two kinds of treatment gases into said treatment chamber;

an exhaust system having at least one pump, configured to exhaust the treatment gases from said treatment chamber;

a heater configured to heat said exhaust system that is on a downstream side of the pump on a final stage.

Claim 15 (Original): A substrate treatment device as set forth in claim 14, wherein the treatment gases include at least one of TiF₄, TiCl₄, TiBr₄, TiI₄, Ti[N(C₂H₅CH₃)₂]₄, Ti[N(CH₃)₂]₄, Ti[N(C₂H₅)₂]₄, TaF₅, TaCl₅, TaBr₅, TaI₅, Ta(NC(CH₃)₃)(N(C₂H₅)₂)₃, Ta(OC₂H₅)₅, Al(CH₃)₃, Zr(O-t(C₄H₉))₄, ZrCl₄, SiH₄, Si₂H₆, SiH₂Cl₂, and SiCl₄.

Claim 16 (Original): A substrate treatment device as set forth in claim 14, further comprising:

a supply controller configured to control said supply system to supply said treatment

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gases alternately.

Claim 17 (Withdrawn): A substrate treatment method comprising:

a metal-containing gas supply step of supplying a metal-containing gas at a first flow rate into a treatment chamber while the treatment chamber has a substrate placed therein;

a metal-containing gas exhaust step of exhausting the metal-containing gas from the treatment chamber via an exhaust system;

a nitriding agent gas supply step of supplying a nitriding agent gas into the treatment chamber at a second flow rate that is 10 times as large as the first flow rate or at a larger rate; and

a nitriding agent exhaust step of exhausting the nitriding agent gas from the treatment chamber via the exhaust system.

Claim 18 (Withdrawn): A substrate treatment method as set forth in claim 17, wherein the nitriding agent gas is supplied at a flow rate of 300 sccm to 1000 sccm.

Claim 19 (Withdrawn): A substrate treatment method as set forth in claim 17, wherein the metal-containing gas includes at least one of TiF_4 , TiCl_4 , TiBr_4 , TiI_4 , $\text{Ti}[\text{N}(\text{C}_2\text{H}_5\text{CH}_3)_2]_4$, $\text{Ti}[\text{N}(\text{CH}_3)_2]_4$, $\text{Ti}[\text{N}(\text{C}_2\text{H}_5)_2]_4$, TaF_5 , TaCl_5 , TaBr_5 , TaI_5 , and $\text{Ta}(\text{NC}(\text{CH}_3)_3)(\text{N}(\text{C}_2\text{H}_5)_2)_3$.

Claim 20 (Withdrawn): A substrate treatment method as set forth in claim 17, wherein the nitriding agent gas includes NH_3 .

Claim 21 (Withdrawn): A cleaning method for a substrate treatment device, comprising:

a substrate treatment device preparing step of preparing a substrate treatment device that treats a substrate by supplying a metal-containing gas and a nitriding agent gas to the substrate; and

a nitriding agent gas supply step of supplying a nitriding agent gas into an exhaust system of the substrate treatment device while the substrate treatment device does not have the substrate placed therein.

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Claim 22 (Withdrawn): A cleaning method for a substrate treatment device as set forth in claim 21, wherein the nitriding agent gas supplied in said nitriding agent gas supply step is supplied at a flow rate larger than a flow rate of the nitriding agent gas supplied for the treatment.

Claim 23 (Withdrawn): A cleaning method for a substrate treatment device as set forth in claim 21, wherein the nitriding agent gas supplied in said nitriding agent gas supply step is supplied at a flow rate of 300 sccm to 1000 sccm.

Claim 24 (Withdrawn): A cleaning method for a substrate treatment device as set forth in claim 21, wherein the metal-containing gas includes at least one of TiF_4 , TiCl_4 , TiBr_4 , TiI_4 , $\text{Ti}[\text{N}(\text{C}_2\text{H}_5\text{CH}_3)_2]_4$, $\text{Ti}[\text{N}(\text{CH}_3)_2]_4$, $\text{Ti}[\text{N}(\text{C}_2\text{H}_5)_2]_4$, TaF_5 , TaCl_5 , TaBr_5 , TaI_5 , and $\text{Ta}(\text{NC}(\text{CH}_3)_3)(\text{N}(\text{C}_2\text{H}_5)_2)_3$.

Claim 25 (Withdrawn): A cleaning method for a substrate treatment device as set forth in claim 21, wherein the nitriding agent gas includes NH_3 .

Claim 26 (Withdrawn): A cleaning method for a substrate treatment device, comprising a nitriding agent gas supply step of supplying a nitriding agent gas into an exhaust system of the substrate treatment device that treats a substrate by supplying a metal-containing gas and a nitriding agent gas, while the substrate treatment device does not have the substrate placed therein.